REMARKS

By the present amendment and response, Figures 2-4 have been amended to overcome the Examiner's objections. Claims 4-5, 7-8, 11-14, 16-17, 20, and 23-26 have been amended to overcome the Examiner's rejections or for clarification purposes. Claims 9 and 21 are being canceled. Claims 1-26 are pending in the present application. Reconsideration and allowance of pending claims 1-8, 10-20, and 22-26 in view of the following remarks are requested.

A. Objection to the Drawings

The Examiner has objected to Figures 2-4 as failing to comply with 37 CFR §1.84(p)(5). As mentioned herein, the attached three replacement sheets of drawings include changes to Figures 2-4. These sheets, which include Figures 2-4, replace the original sheets including Figures 2-4. In Figure 2, reference numerals 229, 235, 240, 242, and 244, along with their respective lead lines, have been deleted. In Figure 3, reference numerals 300 and 301, along with their respective lead lines, have been deleted. In Figure 4, reference numerals 400 and 430, along with their respective lead lines, have been deleted. Applicant respectfully submits that the objections to the drawings should be withdrawn.

B. Objection to the Specification

The Examiner has objected to misspelled words in the specification on pages 12, 17-18, and 20-23. Applicant has corrected the spelling of the words accordingly, as shown above.

The Examiner has objected to the title as not being descriptive. The title has been changed to: "Noise Suppression in the Frequency Domain by Adjusting Gain According to Voicing Parameters".

Consequently, Applicant respectfully requests that the objection to the specification be withdrawn.

C. Objection to Claims

The Examiner has objected to claims 7 and 16 as containing misspellings of the word "frequency". Applicant has corrected the spelling of the word "frequency" accordingly.

The Examiner has objected to claims 4-5, 13-14, and 25 as failing to define variables within the claims. Applicant has amended claims 4-5, 13-14, and 25 to define the variables.

The Examiner has objected to claims 8-9, 11-12, 20-21, 23-24, and 26 as failing to provide proper antecedent basis for the claimed subject matter. Applicant has canceled claims 9 and 21, and amended claims 8, 11-12, 20, 23-24, and 26 in order to more clearly

define the claimed invention. Consequently, Applicant respectfully requests that the objection to claims 8-9, 11-12, 20-21, 23-24, and 26 be withdrawn.

D. Rejection of Claims 1, 3, 6, 7, 17, and 19 under 35 USC §102(b)

The Examiner has rejected claims 1, 3, 6, 7, 17, and 19 under 35 USC §102(b) as being anticipated by U.S. Patent Number 4,628,529 to Borth, et al. ("Borth"). For the reasons discussed below, Applicant respectfully submits that the present invention, as defined by independent claims 1 and 17, is patentably distinguishable over Borth.

The present invention relates to noise suppression for speech coding purposes. As discussed in the present application, a goal of an ideal noise suppressor system or method is to reduce the noise level without distorting the speech signal, and in effect, reduce the stress on the listener and increase intelligibility of the speech signal.

Conventional approaches are fairly simplistic, typically only considering one dynamic parameter, i.e. the dynamic change in the signal-to-noise ("SNR") value, in determining channel gains. However, the SNR calculation is merely an estimation of the noise to signal. The SNR is simply an average, which may be more or less than the true SNR value for specific areas of each channel. As a result of its mere reliance on the SNR value, the conventional approach suffers from improperly altering the voiced areas of the speech, and thus, causes degradation in voice quality.

In accordance with one embodiment disclosed in the present application at page 23, lines 10-12:

> "The present invention overcomes the drawbacks of the conventional approaches and improves the gain computation by using other dynamic or voicing parameters, in addition to the SNR parameter used in conventional approaches to noise suppression."

The voicing parameter can be, for example, a speech classification of the first signal portion. See, for example, amended claim 11.

Referring to the present application at page 20, line 14 to page 21, line 3:

> "Referring to FIG. 2, the encoder 200 further classifies the pre-processed speech signal 207. The calssification (sic) module 230 is used to emphasize the perceptually important features during encoding. According to one embodiment, the three main frame-based classifications are detection of unvoiced noise-like speech, a six-grade signal characteristic classification, and a six-grade classification to control the pitch pre-processing. The detection of unvoiced noise-like speech is primarily used for generating a pitch pre-processing. In one embodiment, the classification module 230 classifies each frame into one of six classes according to the dominating feature of that frame. The classes are: (1) Silence/Background Noise, (2) Noise-Like Unvoiced Speech, (3) Unvoiced, (4) Onset, (5) Non-Stationary Voiced and (6) Stationary Voiced. In some embodiments, the classification module 230 does not initially distinguish between non-stationary and stationary voiced of classes 5 and 6, and instead, this distinction is performed during the pitch pre-processing, where additional information is available to the encoder 200. As shown, the input parameters to the classification module 230 are the pre-processed speech signal 207, a pitch lag 231, a correlation 233 of the second half of each frame and the VAD information 225."

Various advantages of the invention, some of which were discussed above, result from the invention as disclosed and claimed.

In contrast to the present invention, Borth relies on a technique of implementing a post-processed signal to generate background noise estimate 325. The purpose of this technique is to provide a more accurate measurement of background noise energy.

Borth does not disclose, teach, or even suggest calculating a gain for a signal using an SNR and classification or voicing parameter. Borth teaches, at column 9, lines 4-20, producing channel energy estimates 225 that are applied to three distinct blocks. At column 10, lines 34-35, Borth discloses using SNR estimates to select particular channel gain values comprising modification signal 245. Therefore, Borth does not disclose or suggest the present invention as defined by independent claims 1, 8, 17, and 20, nor does Borth achieve some of the advantages of the present invention discussed above.

For the foregoing reasons, Applicant respectfully submits that the present invention as defined by independent claims 1 and 17 is not taught, disclosed, or suggested by Borth. Thus, independent claims 1 and 17 are patentably distinguishable over Borth. As such, the claims depending from amended independent claims 1 and 17 are, *a fortiori*, also patentably distinguishable over Borth for at least the reasons presented above and also for additional limitations contained in each dependent claim.

E. Rejection of Claims 2 and 18 under 35 USC §103(a)

The Examiner has rejected claims 2 and 18 under 35 USC §103(a) as being obvious with respect to Borth in view of U.S. Patent Number 5,812,970 to Chan, et al. ("Chan"). Applicant respectfully submits that claims 2 and 18 depend from independent

claims 1 and 17, respectively, and thus, claims 2 and 18 should be allowed at least for the same reasons discussed above in conjunction with patentability of independent claims 1 and 17.

F. Rejection of Claims 4 and 5 under 35 USC §103(a)

The Examiner has rejected claims 4 and 5 under 35 USC §103(a) as being obvious with respect to Borth in view of U.S. Patent Number 4,532,648 to Noso, et al. ("Noso"). Applicant respectfully submits that claims 4 and 5 depend from independent claim 1 and thus, claims 4 and 5 should be allowed at least for the same reasons discussed above in conjunction with patentability of independent claim 1.

G. Rejection of Claims 8-12, 15-16, 20-24 and 26 under 35 USC §103(a)

The Examiner has rejected claims 8-12, 15-16, 20-24, and 26 under 35 USC §103(a) as being obvious with respect to Chan in view of Borth. For the reasons discussed below, Applicant respectfully submits that the present invention, as defined by independent claims 8 and 20, is patentably distinguishable over Chan in view of Borth.

Chan teaches a method for reducing noise in a speech signal by supplying a speech signal to a speech encoding apparatus. The speech encoding apparatus includes a filter that suppresses a predetermined frequency band of the speech signal to be input to the speech encoding apparatus.

The Examiner asserts that Chan, at Figure 1, reference numeral 7, calculates a gain for the second signal portion using the SNR and a voicing parameter, as recited in independent claims 8 and 20 of the present invention. However, referring to Figure 1 of Chan, Chan merely teaches an Hn value calculating unit 7. As inputs, Hn value calculating unit receives the output of CE and NR value calculating unit 36 and the output of initial filter response calculating unit 33. However, Chan does not disclose, teach, or suggest calculating a gain for a signal using an SNR and voicing parameter, as recited in independent claims 8 and 20.

Borth does not cure the deficiencies of Chan. As mentioned above, in stark contrast to the present invention, Borth relies on a technique of implementing a post-processed signal to generate background noise estimate 325. The purpose of this technique is to provide a more accurate measurement of background noise.

Borth, alone or in combination, does not disclose, teach, or suggest calculating a gain for a signal using an SNR and voicing parameter. Borth teaches, at column 9, lines 4-20, producing channel energy estimates 225 that are applied to three distinct blocks. At column 10, lines 34-35, Borth discloses using SNR estimates to select particular channel gain values comprising modification signal 245. Consequently, Borth does not teach the present invention as defined by independent claims 8 and 20.

For the foregoing reasons, Applicant respectfully submits that the present invention, as defined by independent claims 8 and 20, is not taught, disclosed, or suggested by Chan in view of Borth. Thus, independent claims 8 and 20 are patentably

distinguishable over Chan in view of Borth. As such, the claims depending from independent claims 8 and 20 are, *a fortiori*, also patentably distinguishable over Chan in view of Borth for at least the reasons presented above and also for additional limitations contained in each dependent claim.

H. Conclusion

Based on the foregoing reasons, the present invention, as defined by amended independent claims 1, 8, 17, and 20, and claims depending therefrom, is patentably distinguishable over the art cited by the Examiner. Thus, claims 1-8, 10-20, and 22-26 pending in the present application are patentably distinguishable over the art cited by the Examiner. As such, and for all the foregoing reasons, an early Notice of Allowance of claims 1-8, 10-20, and 22-26 pending in the present application are respectfully requested.

Respectfully Submitted,
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